
Materials and Processes

for the

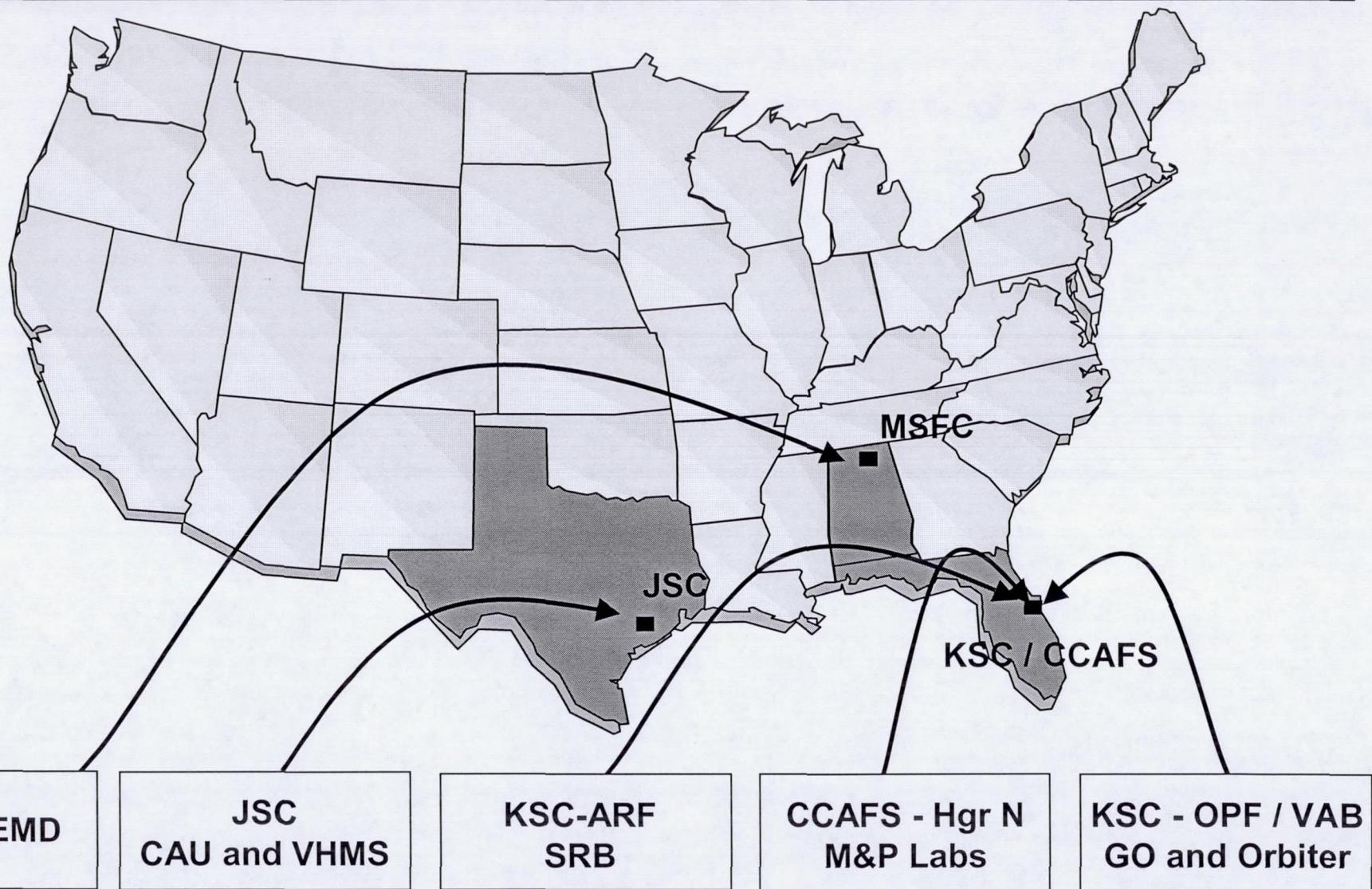
New Millennium

**Materials and Process Engineering
Florida Technical Services
United Space Alliance, LLC**

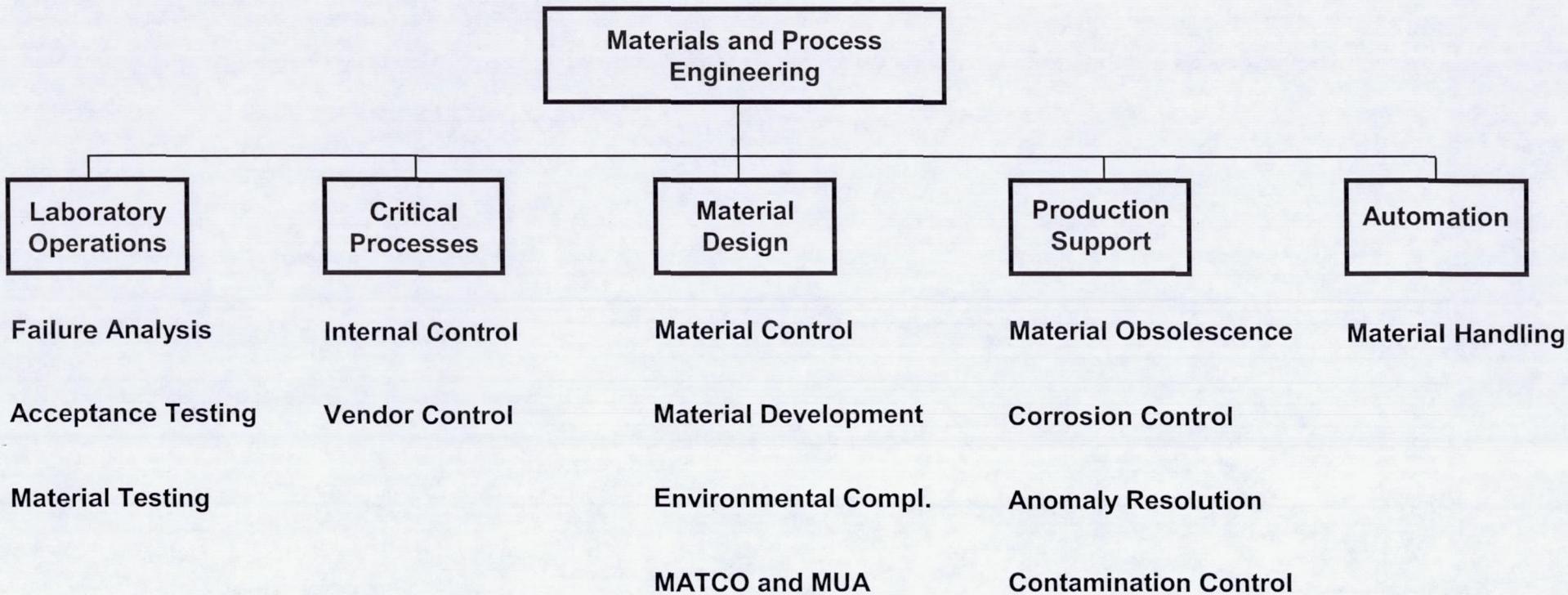
April 16, 2004

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USA Materials and Process Engineering



Responsibilities and Capabilities



The Last Decade – *Environmental Compliance*

- *The single greatest threat to material availability over the last decade has been Compliance to New Environmental Regulations*
- *Federal Regulations*
 - *Clean Air Acts Amendments – 1990*
 - *Titles I, III and VI*
 - *NASA Interim Policy – 1995 end date*
 - *Montreal Protocol – 2000 and 2005 end dates*
 - *Industrial Toxics Project – HAP emissions by 1995*
 - *Florida DER – VOC limits by 1995 (CA)*
 - *OSHA Health Related Regulations*
 - *Carcinogens*
 - *Mutagens*
 - *Toxins*
- *Material availability complicated by local and state regulations and their own compliance schedules*

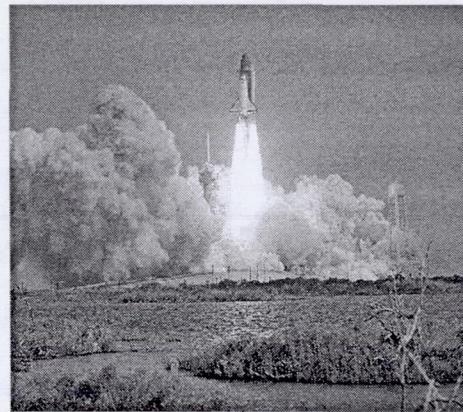
The Last Decade – Major SRB Environmental Initiatives

- Replacement of Booster Close-out material with a trowellable ablator – Eliminated human mutagen
- Replaced lead based paint system with a water based paint system – Eliminated lead, Hazardous Air Pollutant (HAP) and VOC content
- Qualified Tric-Free Paint – Eliminated 1,1,1 - Trichloroethane
- Qualified and Implemented environmentally friendly cleaners – Eliminated hazardous solvent
- Qualified foam blowing agent replacement
- *Replaced MSA-2 with Marshall Convergent Coating (MCC-1) – Eliminated methylene chloride, perchloroethylene and hazardous waste*
- Replaced insulation on USAF Titan IV – Eliminated Freon agent
- *Replaced hazardous metal pretreatment process with non hazardous pretreatment – Eliminated large volume hazardous waste*

The Last Decade – *Thermal Protection System (TPS) Materials*

Convergent Spray Technology – Marshall Convergent Coating – MCC-1 Patented Process

Only solventless sprayable TPS



Robotically Applied

First On-Demand TPS delivery system

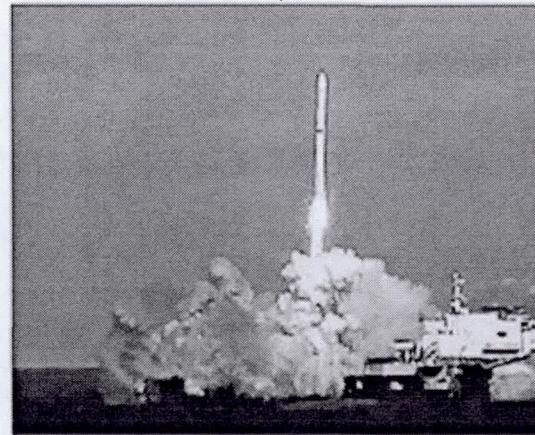
Features automated material handling

Utilizes long-proven materials

Recognized industry-wide



Titan IV

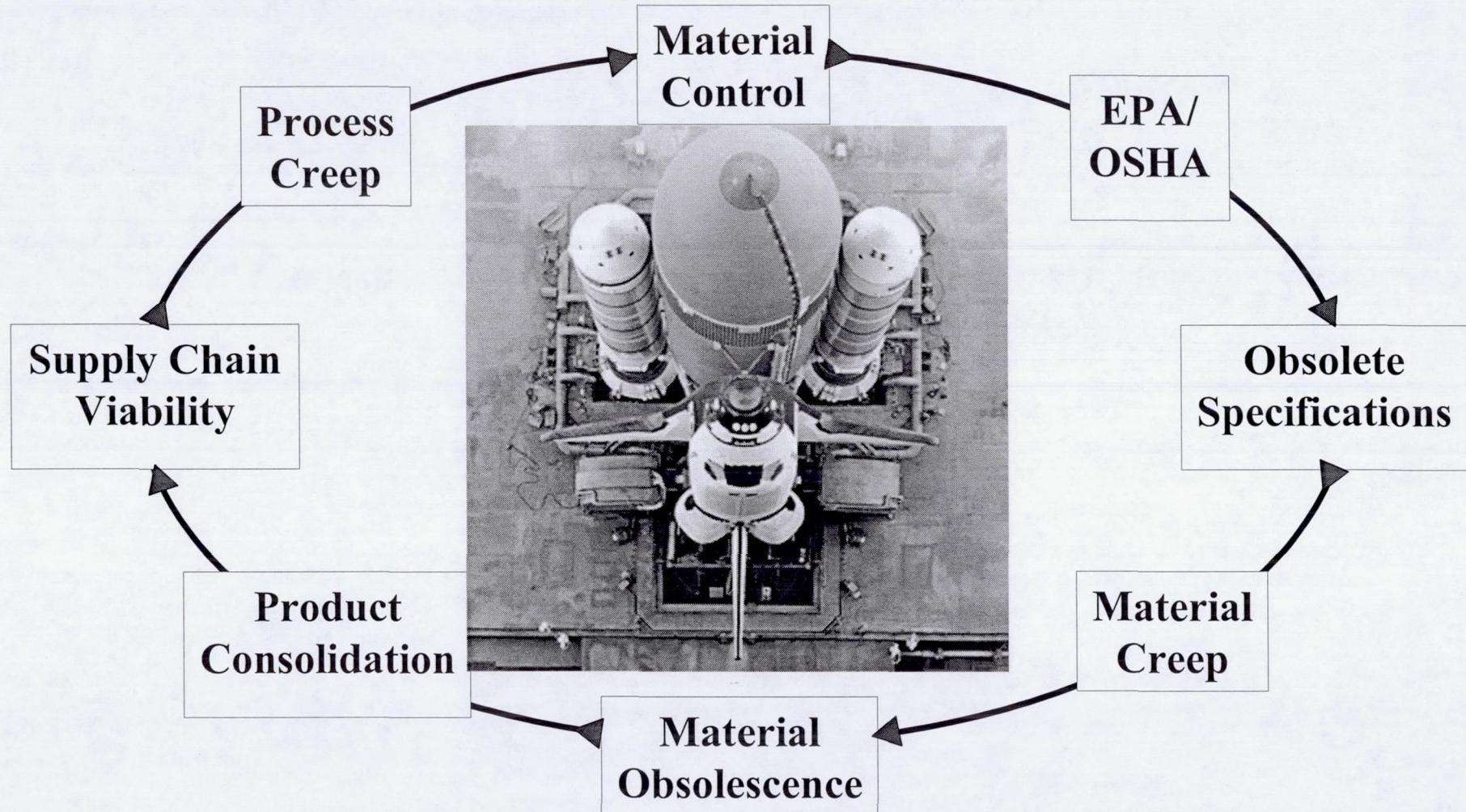


Sea Launch



Delta IV

The Next Decade – *Managing Material Change and Obsolescence*



The Next Decade – *Managing Material Change and Obsolescence*

- ***Over the past decade, managing compliance with environmental regulations and supply chain viability has been the greatest challenge***

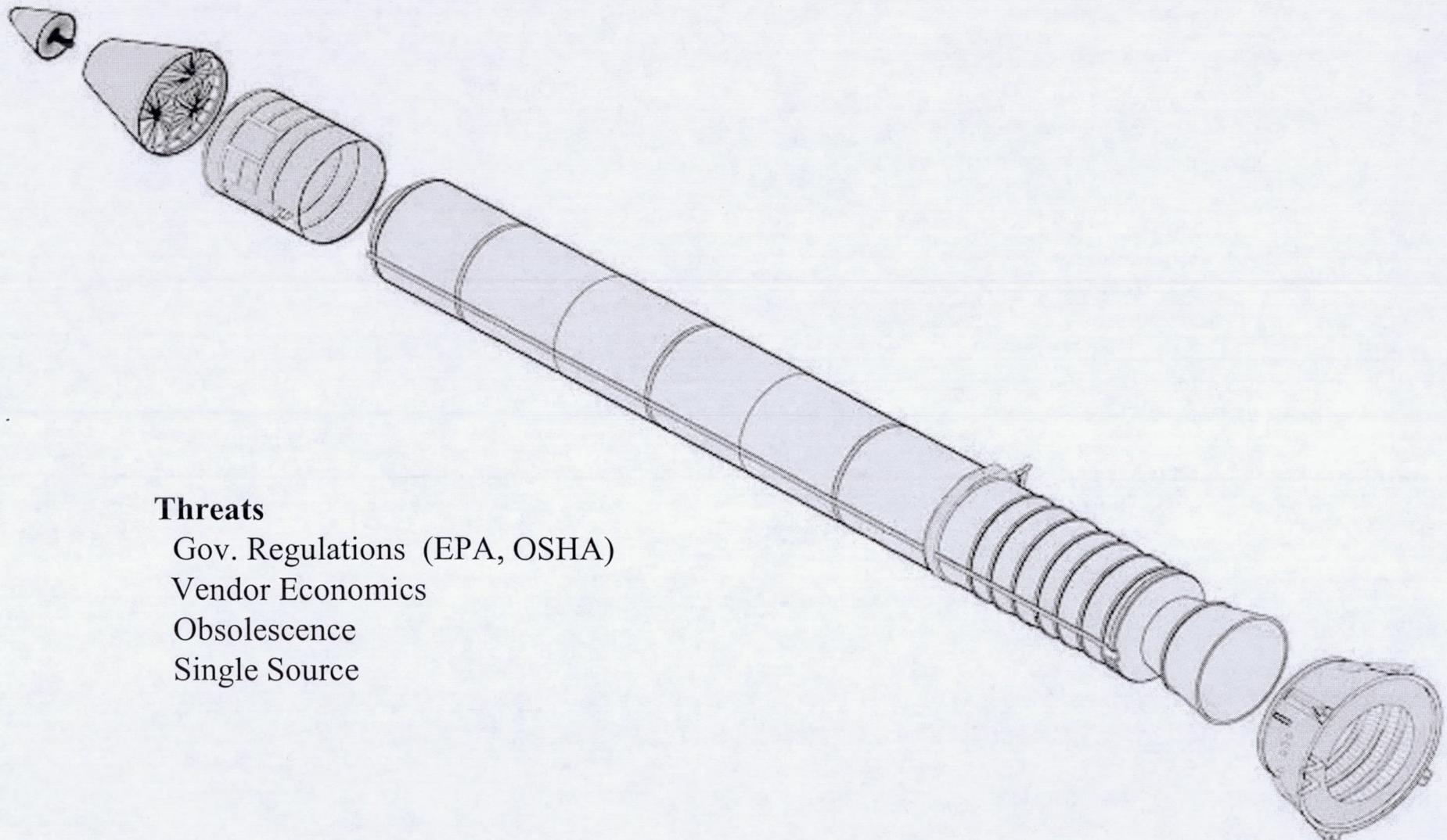
1999 *Rustoleum to Briner product (CarboLine product as alternate)*

2000 *CarboLine buys Briner, eliminates Briner product*

2000 *Briner product to Rustoleum*

2001 *CarboLine reformulates the alternate material*

The Next Decade – *Managing Material Change and Obsolescence*

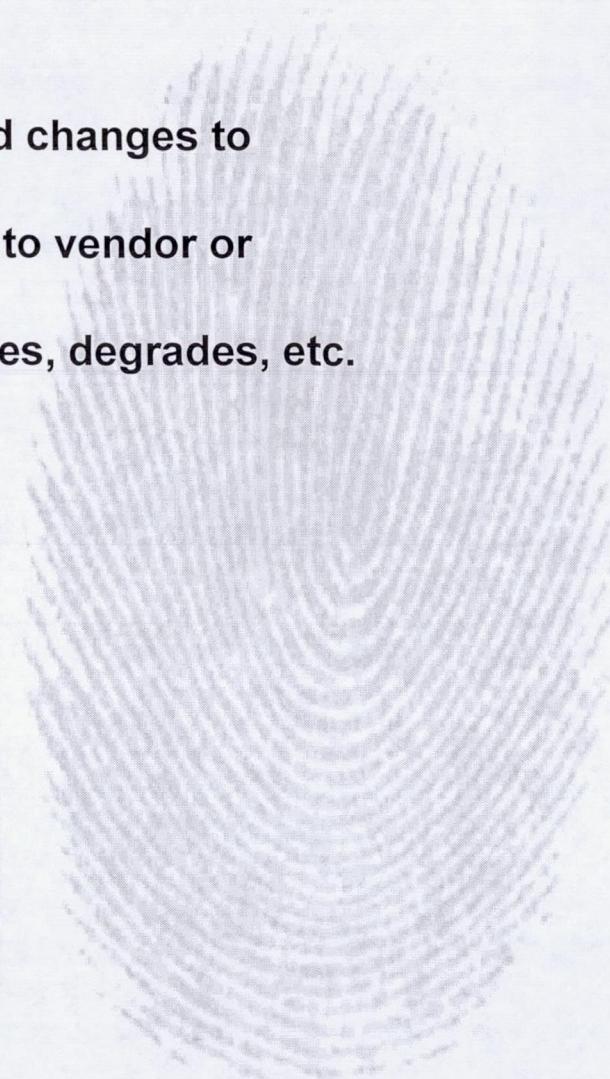
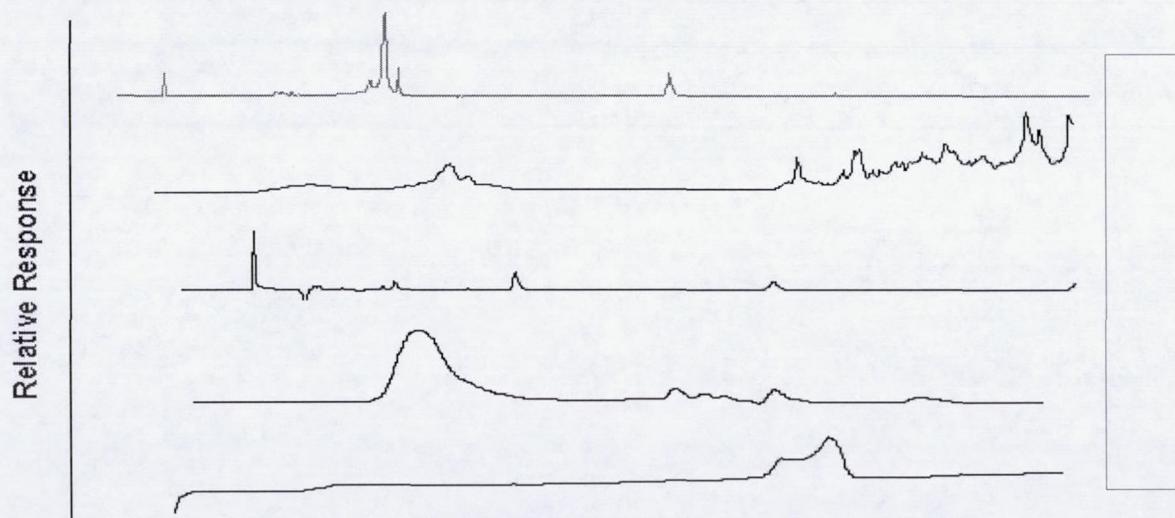


Threats

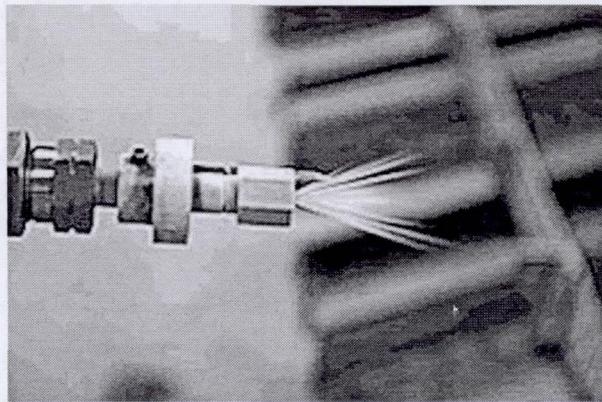
- Gov. Regulations (EPA, OSHA)
- Vendor Economics
- Obsolescence
- Single Source

The Next Decade – *Material Fingerprinting*

- Objectives of Chemical Fingerprinting
 - Enhanced understanding of material composition
 - Reduced probability of unexpected and unrecognized changes to critical materials
 - Enhanced ability to detect changes in a material due to vendor or subtier supplier changes
 - Improved understanding of how a material works, ages, degrades, etc.

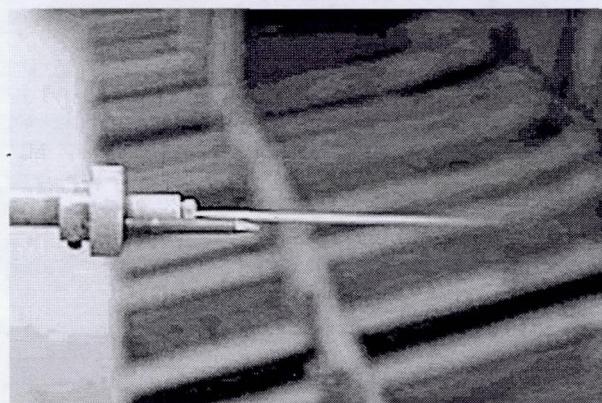


The Next Decade – *De-Coating Technology*



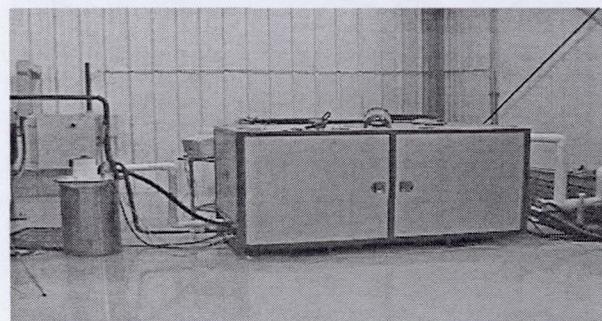
Water Based De-Coating System

- Existing De-Coating operation uses high pressure water
- Results in corrosive environment for metallic hardware
- Waste stream significantly increased by water content
- Disposal costs increased proportionally

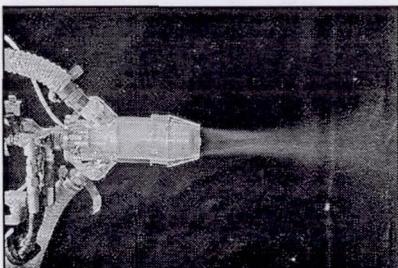


High Pressure LN2 De-Coating System

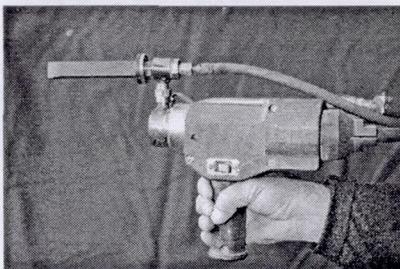
- Patented Process
- Creates No Secondary Waste Stream
- Hazardous Waste Reduction
- Commercially Available Components
- Insulated Components Protect From Low Temperature Contact



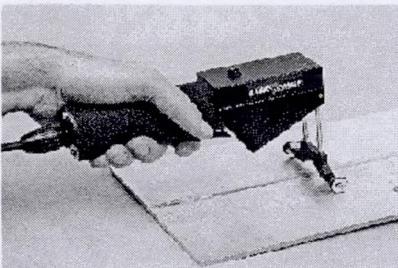
The Next Decade – New Materials and Technology



Thermal Management Coating



Cold Spray



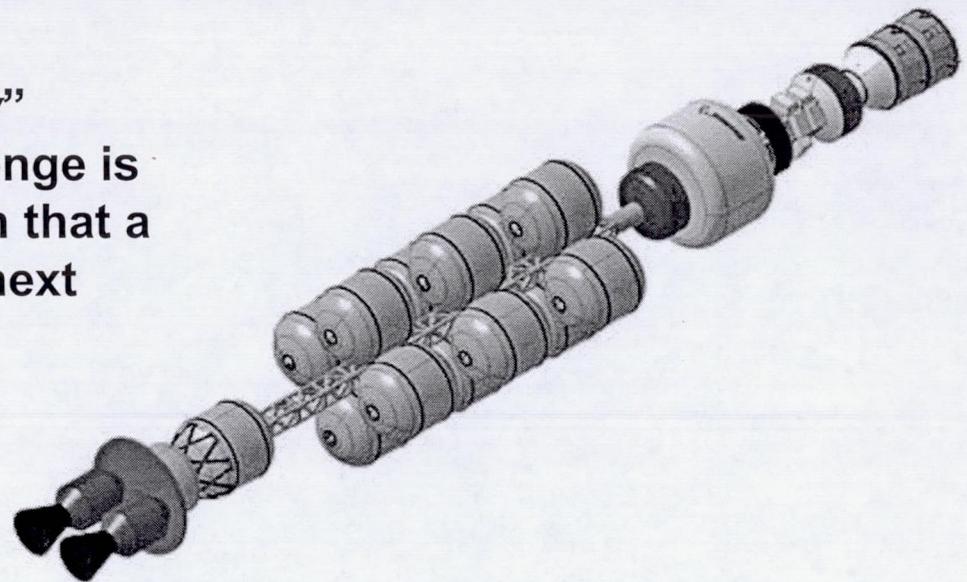
Laser-based Corrosion Mapping



Corrosion Inhibiting Paint Additives

The Next Decade – Space Shuttle to CEV

- The challenge is not identifying “New” materials and technology – the challenge is managing our existing materials such that a viable “material base” exists for the next generation vehicle



- The next generation vehicle will no doubt use the same families of materials, in largely the same environments
- Control and management of our existing materials and processes offers the only cost and schedule effective means by which to address the requirements of next generation vehicles